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Forest Insect and Disease Management

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MOUNTAIN PINE BEETLE

South Dakota State
Progress Report #1

1979

Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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INTRODUCTION

In 1974, the State of South Dakota initiated a mountain pine beetle control program on private lands in the Exemption Area of the Black Hills of South Dakota. In operable areas, infested trees were salvage-logged and in inoperable areas, infested trees were felled and either burned or chemically treated. Through 1976, the objective of the program was solely to control the mountain pine beetle.

In 1977 a 7-year cooperative project between the State of South Dakota and the Forest Service was started in and adjacent to the Exemption Area. The objectives of the project were to harvest, and mechanically and chemically treat mountain pine beetle-infested trees on private and Forest Service lands to reduce the infestation and to reduce residual stand susceptibility to the mountain pine beetle.

A summary of accomplishments from FY 1974 to FY 1979 is given in Table 1.

The purpose of this progress report is to:

1. Describe current stand and entomological conditions within the project area.

2. Point out priority work areas to effectively accomplish the goals of the project by the end of FY 1983.

TABLE 1. Accomplishments, Mountain Pine Beetle Control
South Dakota State Cooperative Area, 1974-1979

Fiscal Year	Private Lands				U.S. Forest Service Land				Total Acres	Total Infested Trees
	Acres	Infested Trees			Acres	Infested Trees				
		Treated	Salvaged	Total		Treated	Salvaged	Total		
1974	4,500	15,233	26,100	41,333	--	--	--	--	4,500	41,333
1975	11,190	51,615	119,776	171,390	--	--	--	--	11,190	171,390
1976	18,550	61,774	81,424	143,193	--	--	--	--	18,550	143,193
1977	12,434	59,581	28,038	87,619	--	--	--	--	12,434	87,619
1978	23,635	45,077	16,371	61,448	1,000	2,016	1,300	3,316	24,635	64,765
1979	26,832	18,364	23,243	42,107	8,121	7,851	17,450	25,301	34,953	67,408

METHODS

Both strip and variable plot cruises were conducted in 9 of the 12 control units. The location of cruise lines are shown in Figure 1. Cruise lines were one mile long, 1/2 chain wide and 10 chains apart. All mountain pine beetle-attacked trees were recorded by diameter (d.b.h. to the nearest 0.1 inch) and attack class:

1. New - 1979 infested
2. Old - 1978 infested
3. PO - 1979 pitchout

Variable plots (10 BAF) were located at the beginning and end of each cruise line and at 10 chain intervals along cruise lines. All green ponderosa pine, birch, aspen and spruce trees greater than 5 inches d.b.h. were counted and diameters (d.b.h. to the nearest 0.1 inch) measured.

RESULTS

A summary of the strip cruise data is given in Table 2. The attack ratios indicate that the mountain pine beetle is increasing in four control units (units 2, 6, 7a, and State Unit 3), decreasing in four control units (units 8, 10, State Unit 1 and State Unit 2), and static in unit 4. The overall attack ratio for the coop area is 1.3:1 indicating an increasing population from 1978 to 1979. An indication that beetle populations did not increase to their full potential from 1978 to 1979 was the number of pitchouts counted. Over the entire area, 34 percent of the trees attacked were successful in pitching out the beetle.

The estimated number of newly infested trees per acre is 0.8 over the entire Cooperative Area. Units 2 and 4 contain the greater portion of the new infested trees.

A summary of the variable plot data is given in Table 3. Average residual stand basal area ranged from 47.8 $\pm$ 7.0 sq ft/ac in the State Unit 3 to 93.6 $\pm$ 8.2 sq ft/ac in unit 7. The average basal area over the survey area is estimated to be 73.8 $\pm$ 5.2 sq ft/ac. In all units, ponderosa pine is the major tree species contributing to the total basal area. Basal area information given here does not take into consideration trees less than 5 inches d.b.h. Only trees normally considered to be susceptible to mountain pine beetle attack

FIGURE 1 - LOCATION OF CONTROL UNITS AND CRUISE LINES
SOUTH DAKOTA STATE COOPERATIVE AREA, 1979

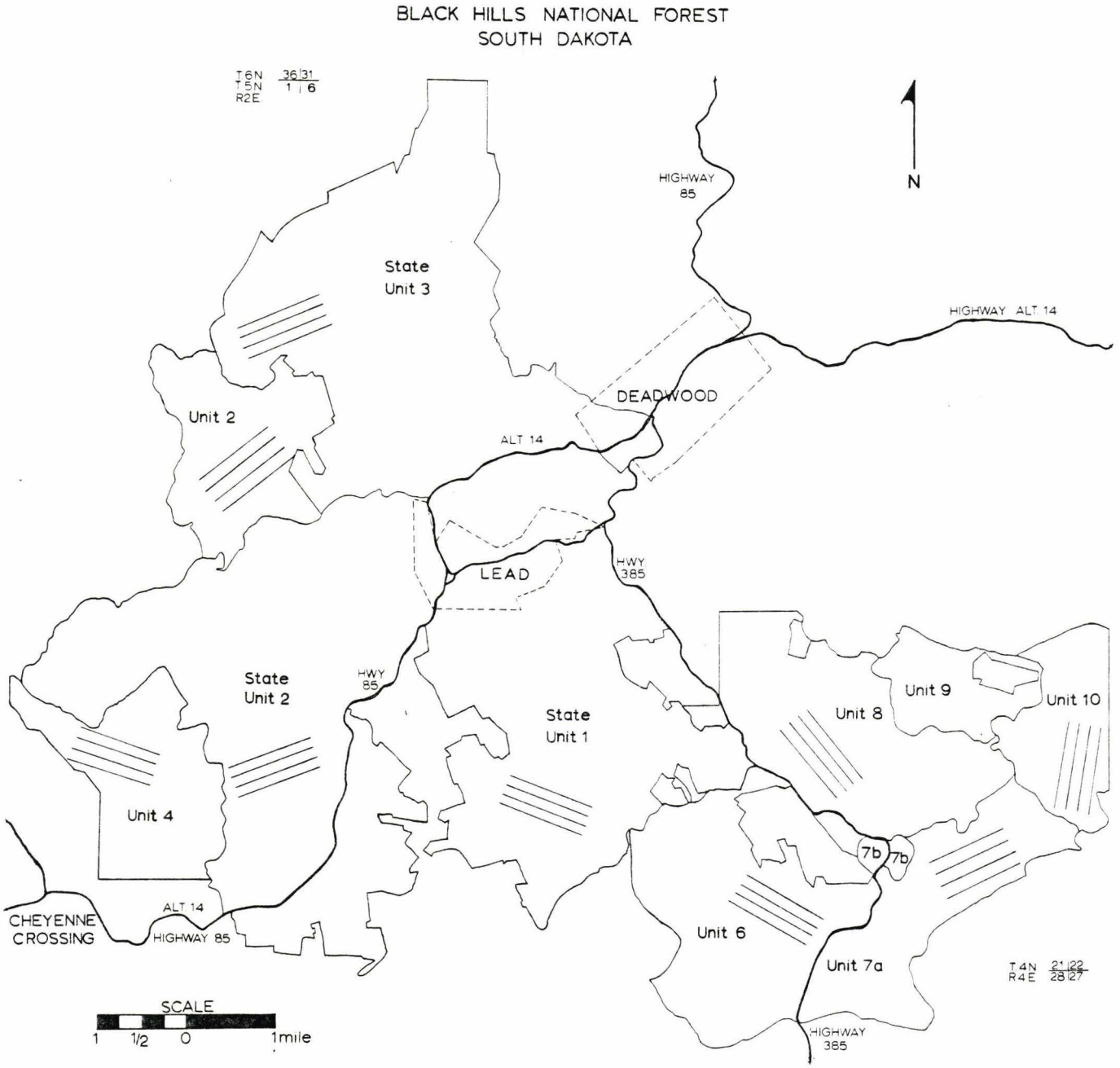


TABLE 2 - SUMMARY OF STRIP CRUISE DATA BY CONTROL UNIT
SOUTH DAKOTA STATE COOPERATIVE AREA, 1979

Unit	Ave. Dia. (in) by Attack Class			No. of Attacked Trees			New Infest. Trees/Acre	Attack Ratio New/Old	Infestation Trend
	New	Old	PO	New	Old	PO			
2	7.9	11.2	8.3	55	12	29	3.4	4.6	inc.
4	10.3	10.5	10.1	25	25	9	1.6	1.0	static
6	12.0	15.2	12.6	15	3	8	0.9	5.0	inc.
7 a	14.0	16.3	12.9	2	1	2	0.1	2.0	inc.
8	-	11.1	10.0	-	6	2	0	-	dec.
10	8.3	9.1	10.9	10	17	5	0.6	0.6	dec.
State Unit 1	12.4	9.8	6.7	7	14	5	0.4	0.5	dec.
State Unit 2	12.3	11.4	8.4	12	19	4	0.8	0.6	dec.
State Unit 3	13.3	-	11.0	2	-	3	0.1	-	inc.
TOTAL				128	97	67			
Average $\pm$ SE	11.3 $\pm$ 0.8	11.8 $\pm$ 0.9	10.1 $\pm$ 0.7				0.8 $\pm$ 0.4	1.3	inc.

TABLE 3 - SUMMARY OF VARIABLE PLOT DATA BY CONTROL UNIT
SOUTH DAKOTA STATE COOPERATIVE AREA, 1979

Unit	Ave. Dia. (in) by Tree Species				Basal Area (sq.ft./ac) by Tree Species				
	PP	BIR	ASP	SP	PP	BIR	ASP	SP	TOTAL ± SE
2	9.9	-	7.5	11.1	48.6 ± 6.5	-	5.3	7.5	61.4 ± 6.4
4	14.1	-	6.7	12.4	44.4 ± 6.8	-	9.2	5.3	58.9 ± 7.0
6	13.0	6.6	7.4	11.8	60.3 ± 6.8	0.8	5.3	6.1	72.5 ± 6.9
7a	12.1	6.8	7.4	11.3	85.0 ± 8.4	0.6	6.4	1.7	93.6 ± 8.2
8	12.1	6.2	7.4	12.9	62.2 ± 7.2	3.6	15.6	0.6	81.9 ± 6.8
10	11.5	6.3	9.4	9.5	75.6 ± 8.3	2.2	4.4	9.4	91.7 ± 7.8
State Unit 1	10.9	-	8.5	11.0	67.5 ± 7.8	-	4.2	13.6	85.3 ± 7.5
State Unit 2	11.5	5.8	8.0	10.7	50.3 ± 7.3	1.4	8.3	11.1	71.1 ± 8.4
State Unit 3	14.3	5.8	7.1	9.0	43.1 ± 7.1	1.1	1.9	1.7	47.8 ± 7.0
Average ± SE	12.2 ± 0.5	6.3 ± 0.2	7.7 ± 0.3	11.1 ± 0.4	59.7 ± 4.8	1.6	6.7	6.3	73.8 ± 5.2

were recorded; therefore, actual basal areas were somewhat higher than indicated. In most cases, where plots contained tree species other than ponderosa pine, these species occurred in pure stands or were dominant over ponderosa pine.

The average residual ponderosa pine basal area is estimated to be 59.7 $\pm$ 4.8 sq ft/ac with a residual stem diameter of 12.2 $\pm$ 0.5 inches. This average residual stem diameter is significantly greater ($P < .05$) than the average stem diameter of trees in the New and PO attack classes but not of trees in the Old attack class.

DISCUSSION

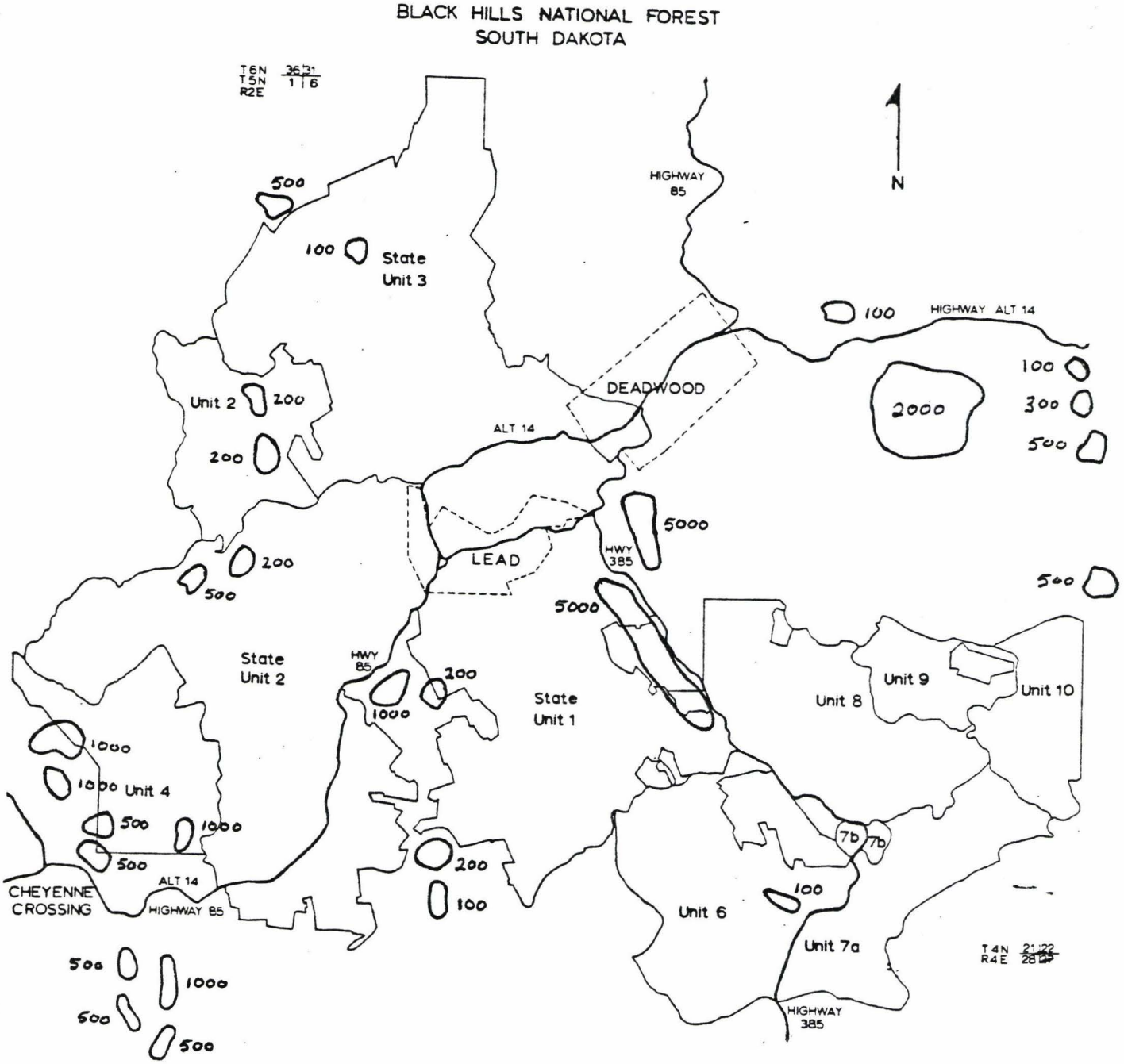
Except for 1977, total acres treated has escalated each year since 1974. Since 1975, total mountain pine beetle trees treated per acre has steadily declined (Table 4). This indicates that some measure of success can be attributed to the past 6 years of control effort.

TABLE 4 - AVERAGE TREES PER ACRE TREATED
SOUTH DAKOTA STATE COOPERATIVE AREA, 1974 - 1979

Fiscal Year	Average Infested Trees Per Acre Treated
1974	9.19
1975	15.32
1976	7.72
1977	7.05
1978	2.63
1979	1.93

The decreasing trend in infested trees per acre indicates that mountain pine beetle-infested ponderosa pines are found less often in large concentrated pockets than in previous years. Instead, small pockets are scattered throughout the control area (Figure 2). Locating and treating infested trees in 1980 will therefore become more difficult. In areas where the concentration of beetle-infested trees is large, project efforts in 1980 should be directed towards treatment of infested ponderosa pines.

FIGURE 2 - APPROXIMATE SIZE AND LOCATION OF LARGE POCKETS OF MOUNTAIN PINE BEETLE INFESTED PONDEROSA PINES, EXEMPTION AREA OF SOUTH DAKOTA. FROM AERIAL RECONNAISSANCE SURVEY, SEPT. 1979



(100) - number of mountain pine beetle infested trees

SCALE
1 ½ 0 1mile

Priority areas for treatment by Control Unit are:

1. From Annie Creek southeast to Icebox Gulch (State Unit 2)
2. War Eagle Hill (State Unit 3)
3. East Spearfish Creek (State Unit 2)
4. Spearfish Peak (State Unit 3)
5. Two Bit Creek (east of Deadwood, SD)

In the remainder of the area where tree mortality is scattered, project efforts should be directed towards reducing stand susceptibility to mountain pine beetle. Inherent in timber harvesting to reduce residual stand susceptibility is the continued marking and removal of currently infested trees. The effort to reduce stand susceptibility should be accelerated for each remaining year of the project.

Current optical bar resource photography (1979) can be used to determine the exact locations of mountain pine beetle infestations and stands of excess basal area in the project area.

Evaluations to determine the variables involved in tree and stand susceptibility are being conducted throughout the northern Black Hills by FI&DM. These variables include:

1. The effect of diameter, tree height and crown ratio on tree susceptibility.
2. The effects of basal area, growing stock level, site quality, tree species composition and weather on stand susceptibility.

An intensive re-evaluation of the State Cooperative Area will be conducted in 1982. All information gained on tree and stand susceptibility in these evaluations will be used to provide the best available recommendations on a stand basis.